

Cheung, Wendy

From: pat obrien <pwob@comcast.net>
Sent: Monday, January 23, 2017 11:18 AM
To: Cheung, Wendy
Subject: RE: DI-2 well completion report, vol 1

Follow Up Flag: Follow up
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Hi Wendy,

Regarding question 3 below:

You are correct-there are multiple shale zones that are acting as confining layers that prevent vertical flow from the perforated zone to the formations above.

Please check the DI-2 geologic strip log to see that shale is the main component of the following formations, all of which should be listed as confining zones along with the Lykins formation:

Pierre Shale,
Niobrara
Greenhorn
Morrison

As you mentioned, we should look at the water quality in the formations between the lowest new confining layer (Morrison) and the Lykins formation to make sure they are not USDWs. There is only one formation in this zone, the Entrada Sandstone. Therefore, I will search for TDS water quality data in this zone near the DI-2 well. Moving up the geologic section from the Entrada to the Pierre Shale (where the lowest 80% bond index section is at 6310 to 6385 feet), the only other formation that is not a shale confining zone is the Dakota. The TDS in this formation is 13662 mg/l, documented in the original Area permit.

If you have any, questions or comments, please let me know.

Pat OBrien

From: Cheung, Wendy [mailto:Cheung.Wendy@epa.gov]
Sent: Friday, January 06, 2017 1:09 PM
To: pat obrien
Subject: RE: DI-2 well completion report, vol 1

Pat,

I have add'l follow-up questions – please see below. Please keep in mind that the values provided in the final permit were best estimates you/ECCV submitted at the time the application was submitted. Subsequent tests after well construction were intended to demonstrate the validity of these values (in particular water quality and fracture pressure gradient data).

Thanks, Wendy

From: pat obrien [<mailto:pwob@comcast.net>]
Sent: Friday, December 30, 2016 4:17 PM
To: Cheung, Wendy <Cheung.Wendy@epa.gov>
Subject: RE: DI-2 well completion report, vol 1

Hi Wendy,

I finally had a chance to look at the questions you had and have answered them below.

POB

From: Cheung, Wendy [<mailto:Cheung.Wendy@epa.gov>]
Sent: Wednesday, December 21, 2016 5:47 PM
To: pat obrien
Subject: RE: DI-2 well completion report, vol 1

Pat,

I have partially reviewed your submission and have a number of questions:

1. The water samples for Admire and Lyons have the footnote: c Maximum reference method residue requirement was exceeded. What does this mean?
[This means that the TDS was so high they had to dilute the sample with distilled water. The results are still valid.](#)

The data from DW-1 for the Lyons was 17,700 compared to 59,000 in DW-2. That's quite a significant increase given it's not that far away. Kill fluids were added several times prior to sampling and I would suspect altered the WQ.

2. How did you determine the formation fluid pressure?
[As described in section I.1.B \(first paragraph\) I obtained the formation fluid pressure using the actual transducer reading at the base of each zone \(at the transducer setting depth\) just prior to running the step test. I believe this is most accurate method to obtain said pressures.](#)

In that section, can you explain what you meant by: "The wellhead pressure at the time of said testing varied slightly but was generally ± 800 psi." ± 800 psi of what?

Also: "For the Lyons Formation where no transducers were used during the SRT the formation pressure is the hydrostatic head plus 800 psi." Why the additional 800 psi?

3. Completion Report provides info on freshwater aquifers. Only 3 were identified, is this section meant to identify all USDWs?
[Yes. All the formations below the Laramie Fox Hills aquifer have TDS levels over 10,000 mg/l. See the original Area permit \(Table 2.1\)](#)

The cement job is not adequate for the deeper portion of the well and potential exists for injection fluids to move in the annular space to shallower aquifers. A couple of options are available, 1) define a new confining zone (the Lykins was initially determined to be the CZ), if this is the case then we need better documentation to show that the aquifers found between the Lykins and the new confining zone are not USDWs – ideally water sample data from nearest wells, another potential option is to calculate salinity by resistivity/density logs or 2) if demonstration of 1) cannot be made, periodically run a Part II test, that would include a radioactive tracer test and/or temperature survey.

4. When did the acid treatment occur?
[After well completion:](#)
[First each individual zone was isolated and sampled for water quality.](#)

Second, each zone was isolated and stimulated with acid. The order was: Lyons, Missourian, Virgil, Admire, Council Groves, Wolfcamp/Amazon.

Third, each zone was isolated and a Step Rate Test was run

Fourth, the permanent production tubing and packer were installed and the final All Zone SRT was run.

Is it true, prior to the all 7 SRTs (individual and the All Zone SRT), you had to kill the well before running the SRTs because it sat overnight?

5. What was the specific gravity of the fluid used during the SRTs?

For all the SRTs, we had to balance, or “kill” the well prior to running in the plug and packer tools. Therefore, the tubing was full of water with a specific gravity ranging from 1.17 to 1.19 prior each SRT. Then fresh water with a specific gravity of 1.0 was used for the SRT itself.

6. Please provide the raw data for the surface gauge during the SRTs.

These data were not provided to us but I ask to contractor for them.

Would still like to get this data.

7. Where was the placement of the pressure transducers for each SRT?

The transducers were set at the depths shown on each SRT graph provided in my email named “volume 2” in the PDF file “DI-2 All SRT Transducer Graphs” which is attached here.

8. How does the slotted casing isolate zones?

The zones are isolated from each other by the permanent Swell Packers outside the 4.5 inch liner (see well design diagram) and on the inside of the 4.5 inch liner using a plug on the bottom and a packer on top of each zone. The plug and packer were temporary tools installed as needed across each zone when swabbing for a water sample, for acid stimulation, and for SRTs.

9. The spinner test was run on just the Wolfcamp, Amazon, and Council Grove. Did you run another test on all the perms, or some other injectivity test?

We did try and run the spinner tool to the bottom of the well, even though not required by the EPA. The propeller in the spinner stopped spinning multiple times and the results of this run are not valid.

Thanks, Wendy

From: pat obrien [<mailto:pwob@comcast.net>]

Sent: Wednesday, December 14, 2016 9:51 AM

To: Cheung, Wendy <Cheung.Wendy@epa.gov>

Subject: RE: DI-2 well completion report, vol 1

Hi Wendy,

The 3 emails I sent should be all of the report.

There should be 6 geophysical logs in the emails I sent. I also sent you the same 6 logs in hard copy for your convenience. There is also one geologic strip log, which I sent only as a hard copy as the email version is about 34 meg and too big to email. Also, it is a lot easier to go through in paper form.

I will send an interpretation of the CBL logs and the temperature log.

Pore pressure is in Table 2 in the MS Word report. The AccuTest laboratory test results of the water samples taken from each zone are in the email labeled Vol 2. These are the original lab results in XL form. There is a much longer set of lab data (with Chain of Custody, QA/QC, etc). If you would like me to send these let me know, but this package is about 85 pages. These results are also summarized in Table 3 in the MS Word report.

Pat OBrien

From: Cheung, Wendy [<mailto:Cheung.Wendy@epa.gov>]
Sent: Wednesday, December 14, 2016 7:27 AM
To: pat obrien
Subject: RE: DI-2 well completion report, vol 1

Pat,

I finally had a chance to look through the 3 emails that you sent me (but have not completed review). I received a set of logs in the mail, is there another package coming or should I print out the contents of the email?

In addition to submitting the logs and tests required in Appendix B, I will also need an interpretation of these log or test results. Not so much the open hole logs, but the CBLs and temperature survey would be helpful.

Well log and test results shall be submitted to the Director within sixty (60) days completion of the logging or testing activity, and shall include a report describing methods used during logging or testing and an interpretation of the log or test re

A couple of items are either missing or perhaps I can't locate: pore pressure and WQ sample of source.

Thanks, Wendy

From: pat obrien [<mailto:pwob@comcast.net>]
Sent: Friday, December 02, 2016 11:54 AM
To: Cheung, Wendy <Cheung.Wendy@epa.gov>
Subject: DI-2 well completion report, vol 1

Hi Wendy,

Attached is the well completion report for the ECCV Class I UIC well DI-2.

As discussed, I will send all I can to you via email. Some of the files are large so it will come in pieces. I hope to send it in six volumes.

Please start with the cover letter and then the body of the report (MS Word format).

The geologic strip log is 34 meg by itself, so I will be sending it along with the geophysical logs in paper form.

Thank you for your help on this project.

Pat OBrien